
Sheet 12

1. In a computer graphics animation scene an object is defined as a planar polyhedron. The object center is located at position $P = [0, 0, 10]$, and the scene is drawn, as normal, in perspective projection with the viewpoint at the origin and the view direction along the negative z-axis. Calculate the transformation matrix that will shrink the object in size by a factor of 0.8 towards its center point
2. Use your matrix of problem 1 to check what happens to the points $[0, 0, 10]$ and $[0, 0, 5]$. Is your result what you expect?
3. In a different animation, the object, defined above is required to rotate clockwise, looking from the origin, while shrinking. In each successive frame it is to rotate by 15 degrees while shrinking to 0.8 of its original size. The rotation axis is to be the z axis, and the shrinkage is, as before, towards the object's center. What is the transformation matrix that will achieve this animation?
4. The scene of problem 3 is to be drawn in perspective projection with the plane of projection being $z=-2$. If you know that the required projection matrix is

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1/2 & 0 \end{bmatrix}$$

Find the combined transformation(Current transformation matrix or CTM)